Powder Metallurgical Materials for Chemical Industry

with plastifying additions or resins. An aftertreatment of the sintered finished product by thermal or chemico-thermal treatment can take place to raise the quality of the article. In the detailed description of powder metallurgical filters among others some production methods are mentioned with the pictures and the individual data of single filters produced of iron granulate mixed with graphite- or bronze granulate, respectively, being mentioned. The properties of the filter as well as the filtration effect depending on various properties, and also the possibilities of arranging the filters are described. "Zinterit" is mentioned for the solidification of packings as well as a material developed analogously to it by V. P. Makhayev (Ref. 19) which is obtained in pressed bands from iron sponge mixed with 18% of petroleum bitumen. In the description of porous electrodes for electro-chemical processes the investigations by L! L. Kuz'min and V. S. Poroykova (Ref. 2o) with porous iron cathodes with a highly active surface for the reduction of hydrogen excess voltage are

Powder Metallurgical Materials for Chemical Industry

described. A bronze graphite (87-90% Cu, 9-10% Sn, the rest is graphite) with a possible addition of lead or iron graphite (97-98% Fe, 2-3% graphite) is mentioned in the production of porous friction bearings. A composition of: 60%-75% Cu, 9-10% Sn, 5-8% graphite, 6-15% Pb, 0-6% Si and up to 10% Fe is mentioned for powder metallurgical friction disks. The properties of titanium and of its alloys, tantalum and its alloys as well as of tungsten, molybdenum and its alloys are described among the chemically resistive metallic and non-metallic alloys for chemical apparatus. The especially high resistance to corrosion of the finished products made of carbides, nitrides, borides and silicides is pointed out and explained. Among the non-metal materials produced and worked according to powder metallurgic methods the carbides and nitrides of silicon, boron carbides as well as various alloys with these additions are mentioned. Apart from those uses above mentioned powder metals also find a direct use in chemical processes in the investigation of various compounds,

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Powder Metallurgical Materials for Chemical Industry

in the production of metal chlorides, iodides, nitrides, hydrides and borides as well as in a number of organic processes of synthesis. The production of porous materials for catalytic processes as well as the use of organosol-metals for anti-detonation materials and many others are mentioned in particular.
There are 4 figures, 3 tables and 28 references, 15 of which are Soviet.

AVAILABLE: Library of Congress

1. Powder metallurgy--USSR 2. Powders--Production

Card 4/4

SAMSONOV, G.V., kand. tekhn. nauk; PLOTKIN, S.Ya., kand. tekhn. nauk.

Cermets for chemical industry. Khim. prom. no.2:106-110 Mr '58.
(MIRA 11:5)
(Cermets)
(Chemical industries--Equipment and supplies)
(Powder metallurgy)

SAMSONOV, G.V.; NESHPOR, V.S.

Physical characteristics of metal-like compounds. Vop.por. met. i prochn.mat. no.5:3-35 '58. (MIRA 12:8)
(Carbides--Testing) (Borides--Testing) (Nitrides--Testing)

21-58-5-17/28

AUTHOR: Samsonov, G.V.

TITLE: Reduction of Chromium Oxide in the Presence of Iron (Vosstanovleniye okisi khroma v prisutstvii zheleza)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 5, pp 535-536 (USSR)

ABSTRACT: Conditions for obtaining chrome steel powder by reducing chromium oxide by carbon in the presence of iron have been investigated. According to A.D. Kramarov [Ref 1] the equilibrium temperature for the reduction of chromium oxide by carbon under atmospheric pressure occurs at about 1,400°C. Experiments of the author have also shown that the full reduction of chromium oxide is obtained at 1,350 to 1,400°C. The temperature of reduction is lowered to 1,150 to 1,250°C when the mixture $Fe_2O_3+Cr_2O_3$ is reduced by carbon. It is shown that a powder-like alloy of iron with 10% Cr in solid solution is obtained as a result of the reduction of chromium oxide in the presence of ferric oxide at 1,150 to 1,250°C, which represents a convenient method of producing powdered chrome steel for the metalloceramic industry. There is 1 table and 1 Soviet reference.

Card 1/2

Reduction of Chromium Oxide in the Presence of Iron 21-58-5-17/28

ASSOCIATION: Institut metallokeramiki i spetssplavov AN UkrSSR (Institute of Metallo-Ceramics and Special Alloys of the AS UkrSSR)

PRESENTED: By Member of the AS UkrSSR, A.I. Brodskiy

SUBMITTED: October 11, 1957

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration

1. Chromium powder alloys--Production

Card 2/2

SLEPTSOV, V.M.; SAMSONOV, G.V.

Boron nitride. Vop.por.met.i prochn.mat. no.6:65-79 '58.
(MIRA 13:4)

(Boron nitrides)

SOV/24-58-7-29/36

AUTHORS: Portnoy, K.I. and Samsonov, G.V. (Moscow, Kiyev)

TITLE: Some Principles of the Alloying of Boride Alloys (Nekotoryye printsipy legirovaniya boridnykh splavov)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 7, pp 140 - 141 (USSR)

ABSTRACT: From a survey of investigations on the production of heat-resisting and non-scaling alloys based on refractory-metal borides the authors formulate five principles for such work. The main items in these are as follows. 1) The strength and plasticity of these alloys depend on the nature of the reaction of the borides with the alloying elements; if the reaction products are eutectics low melting compared with the boride base the strength and plasticity rise. 2) The heat-resisting properties of borides remain high if they are alloyed with other high-melting borides or silicides, or with refractory metals forming with borides high-temperature eutectics (ZrB_2 + Mo), (Ti, Cr)B_2 + ZrB_2. 3) Resistance to oxidation of boride alloys is increased

Card 1/2

Some Principles of the Alloying of Boride Alloys

by alloying with silicon or silicides; silicides are particularly effective if on oxidation their metal forms a volatile oxide.

4) Brittleness can be reduced by reducing bonding forces in the boride base crystal lattice by dissolving less brittle borides in it.

5) Non-spalling characteristics are improved by alloying with substances which reduce brittleness.

There are 9 references, 8 of which are Soviet and 1 English.

SUBMITTED: March 11, 1958

21-58-7-13/27

AUTHORS: Koval'chenko, M.S., Neshpor, V.S. and Samsonov, G.V.

TITLE: Investigation of Zirconium Boride - Molybdenum Alloys (Issledovaniye spavov borida tsirkoniya s molibdenom)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 7, pp 740-742 (USSR)

ABSTRACT: The properties of ZrB_2 - Mo alloys obtained by sintering were investigated. On the basis of the results of visual thermal analysis, metallographic and roentgenographic studies. shrinkage curves, and measuring the macro- and microhardness, a hypothetical diagram of the ZrB_2-Mo system state was composed. The existence of the triple boride Mo_2ZrB_2 was discovered in the system. Conditions for the hot pressing of zirconium boride alloys with molybdenum were studied at molybdenum contents of 5; 40 and 60 molecular per cent. Sufficiently compact alloys were obtained on pressing under a specific pressure of 260 kg/sq cm and temperatures from 2,000 to 2,100°C. There is 1 graph and 10 references, 7 of which are Soviet, and 3 American.

Card 1/2

Inst. Metalloceramics & Special Alloys AS UkrSSR

SOV-21-58-8-9/27

AUTHORS: Samsonov, G.V., Neshpor, V.S., Strel'nikova, N.S.

TITLE: Magnetic Susceptibility of Solid Solutions of Some Metal-Like Compounds (Magnitnaya vospriimchivost' tverdykh rastvorov nekotorykh metallopodobnykh soyedineniy)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 8, pp 838-840 (USSR)

ABSTRACT: Investigations of magnetic susceptibility of metal-like compounds can contribute to an explanation of the nature of chemical bounds in these phases. The authors investigated the magnetic susceptibility of the single-phase solid solutions of the following metal-like compounds: ZrC-NbC; TaC-NbC; TaB_2-ZrB_2 and TiC-TiN. Since the measurements of absolute susceptibility were difficult due to experimental conditions, the values of relative susceptibility were determined by taking that of one of the components for unity. The results of experiments are presented in graphical form showing the dependence of magnetic susceptibility on the concentration. The two curves for the alloys NbC-ZrC and TaB_2-ZrB_2 have peaks, whereas the curve for NbC-TaC does not possess a peak. In

Card 1/2

Magnetic Susceptibility of Solid Solutions of Some Metal-Like Compounds

the alloy TiC-TiN, a sharp fall of the magnetic susceptibility is observed with increasing TiC concentration. The authors attempt to interpret theoretically these experimental data. There are 2 graphs and 5 references, 3 of which are Soviet, 1 German and 1 Polish.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN UkrSSR (Institute of Metalloceramics and Special Alloys of the AS UkrSSR)

PRESENTED: By Member of the AS UkrSSR, V.N. Svechnikov

SUBMITTED: February 26, 1958

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration.

1. Intermetallic compounds--Magnetic properties 2. Intermetallic compounds--Phase studies

SAMSONOV, G.V.; NESHPOR, V.S.

Theoretical assumptions on the structure of heat resistant materials based on metallic compounds [with summary in English]. Inzh.-fiz.zhur. 1 no.8:30-38 Ag '58. (MIRA 11:8)

1.Institut metallokeramiki i spetssplavov AN USSR, Kiyev.
(Refractory materials)

SAMSONOV, G.V. [Samsonov, H.V.]; STREL'NIKOVA, N.S.

On the thermoelectromotive force of some metallic borides and carbides in contact with copper [with summary in English]. Ukr. fiz.zhur. 3 no.1:135-138 Ja-F '58. (MIRA 11:4)

1.Institut metalokeramiki ta spetsial'nikh splaviv AN URSR.
(Thermoelectricity) (Borides--Electric properties)
(Carbides--Electric properties)

AUTHORS: Samsonov, G. V., Neshpor, V. S., Yermakova, V. A. 78-3-4-7/38

TITLE: Investigations of the Properties of the Alloys of the System Niobium-Silicon (Issledovaniye svoystv splavov sistemy niobiy-kremniy)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 4, pp. 868-878 (USSR)

ABSTRACT: The phase composition of the alloys in the system niobium-silicon in concentrations of from 0 to 100 atom% was investigated by radiographic and metallographic methods. Three intermediate compounds were found:
1.-Nb_4Si with hexagonal lattice with the following parameter: a = 3,59 Å, c = 4,46 Å.
2.-Nb_5Si_3 in three modifications, tetragonal α- and β-modifications with parameters a = 6,56 Å and c = 11,86 Å and a = 10,00 Å and c = 5,07 Å, an hexagonal γ-modification with parameters a = 7,52 Å and c = 5,24 Å.
3.-$NbSi_2$ with hexagonal structure a = 4,78 Å and c = 6,56 Å.
The melting points of some alloys were investigated. It was found on this occasion that the compound Nb_4Si has a congruent melting point.

Card 1/2

Investigations of the Properties of the Alloys of the System Niobium-Silicon 78-3-4-7/38

The investigations of the electric conductivity of the alloys of niobium and silicon have three specific points in the phase diagram at 20, 37,5 and 66,6 atom% silicon.
Also the stability of the alloys against oxidation in air at 1000°C was investigated. The alloys are not resistant to corrosion.
Based on the investigations carried out as well as on the analyses of the alloys the phase diagrams of niobium and silicon were constructed.
There are 11 figures, 5 tables, and 18 references, 2 of which are Soviet.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute for Metalloceramics and Special Alloys, AS UkrSSR)

SUBMITTED: June 25, 1957

Card 2/2

78-3-4-11/38

AUTHORS: Meyerson, G. A., Samsonov, G. V., Kotel'nikov, R. B., Voynova, M. S., Yevteyeva, I. P., Krasnenkova, S. D.

TITLE: Some Properties of Alloys of the Metals of the Transition Group With High-Melting Borides (Nekotoryye svoystva splavov boridov tugoplavkikh metallov perekhodnykh grupp)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 4, pp. 898-903 (USSR)

ABSTRACT: In the present paper investigations of the alloys with the systems TiB_2-CrB_2, TiB_2-W_2B_5 and ZrB_2-CrB_2 were carried out. Finely powdered borides of TiB_2, ZrB_2, CrB_2 and W_2B_5 were produced by vacuum-technique methods. The alloys of the system TiB_2-CrB_2 have monophase structure in all intervals of the composition. The alloys of the systems TiB_2-W_2B_5 and ZrB_2-CrB_2 are biphase.
The alloys were investigated with respect to microhardness and it was found that the alloys of the system TiB_2-CrB_2 at 80 Mol% TiB_2 have a maximum microhardness of 4200 kg/mm^2. The curves of microhardness of the systems TiB_2-W_2B_5 and ZrB_2-CrB_2 have the characteristic shape of biphase alloys. With all systems also the metallographic and radiographic

Card 1/2

Some Properties of Alloys of the Metals of the Transition Group With High-Melting Borides

investigation was carried out. In the system TiB_2-CrB_2 continuous series of solid solutions occur, and in the systems TiB_2-W_2B_5 and ZrB_2-CrB_2 the solubility is limited. The solubility of TiB_2 in W_2B_5 and of W_2B_5 in TiB_2 never exceeds 10 or 5 mol%, respectively. The solubility of ZrB_2 in CrB_2 is about 2mol%, of CrB_2 in ZrB_2 it is very small. There are 4 figures, 4 tables, and 18 references, 11 of which are Soviet.

ASSOCIATION: Moskovskiy institut tsvetnykh metallov i zolota im. M. I. Kalinina
(Moscow Institute for Non-Ferrous Metals and Gold imeni M. I. Kalinin)

SUBMITTED: June 25, 1957

SOV/63-3-6-16/43

AUTHOR: Samsonov, G.V., Doctor of Technical Sciences

TITLE: Outlook for the Application of High-Melting Compounds in the Chemical Industry (Perspektivy primeneniya tugoplavkikh soyedineniy v khimicheskoy promyshlennosti)

PERIODICAL: Khimicheskaya nauka i promyshlennost', 1958, Vol III, Nr 6, pp 807-811 (USSR)

ABSTRACT: Carbides, borides, nitrides and silicides of high-melting metals and some non-metals are very resistant to wear, corrosion, and heat. The principal physical properties of these compounds are given in Table 1. Titanium carbide is not affected by concentrated hydrochloric and sulfuric acid. The carbides of boron and silicon are even resistant to boiling acids. Boron nitride is resistant to chlorine at 700°C for 40 hours, to oxidation at the same temperature for 60 hours. Silicon nitride shows no changes after 500 hours in hydrochloric, nitric, sulfuric acid, etc. The highest resistance to acids have silicides, among them molybdenum disilicide, $MoSi_2$. It is resistant to melted sodium, lead, bismuth, etc. Powder metallurgy is the only method for the manufacture of products from high-melting metals. The brittleness of these metals is

Card 1/2

Outlook for the Application of High-Melting Compounds in the Chemical Industry

counterbalanced by alloying them with chromium and nickel. High-melting compounds are used by the plastics industry as filler in order to increase the hardness, heat and corrosion resistance of its products.
There are 5 tables, 2 graphs, and 16 references, 11 of which are Soviet, 3 English and 2 German.

SOV/126-6-2-11/34

AUTHORS: Kudintseva, G. A., Polyakova, M. D., Samsonov, G. V. and Tsarev, B. M.

TITLE: Preparation and Certain Properties of Yttrium Hexaboride (Prigotovleniye i nekotoryye svoystva geksaborida ittriya)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 2, pp 272-275 (USSR)

ABSTRACT: The reaction $Y_2O_3 + 3B_4C = 2YB_6 + 3CO$ was studied over the range 880-1900°C; the reaction occurs in one stage at 970°C. ΔH^0_{298} is about 24 kcal/mol for YB_6; analysis gives 42.11% B (theory 42.19%). Yield at 1800-1900°C 92-93% (YB_6 partially dissociates at this temperature). The powder pattern gives the lattice constant as 4.128 Å. Table 1 gives the d, hkl and intensity values. The pyknometer density is 3.64 ± 0.04 g/cm³ (X-ray density 3.633). Hot-pressed specimens have a microhardness of 3264 ± 21 kg/mm² (50 g load); YB_6 reacts with graphite at 2100-2150°C,

Card 1/2

Preparation and Certain Properties of Yttrium Hexaboride

and fuses at about 2300°C. The thermionic emission (Richardson) curve is compared with those for LaB_6 and CeB_6; the relevant constants are work functions 2.22 ± 0.05 eV and A = 15 amps/cm^2 deg^2. The thermal emission coefficient at 1500°C is 0.7 (for 655 mμ). The results are discussed in relation to the electronic structure of the compound.
There are 2 figures, 3 tables and 11 references, 5 of which are Soviet, 5 English, 1 German.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN Ukr SSR (Institute of Metal Ceramics and Special Alloys, Ac.Sc. Ukr. SSR)

SUBMITTED: December 20, 1956

Card 2/2 1. Yttrium borides--Preparation 2. Yttrium borides--Properties

SAMSONOV, G.V. [Samsonov, H.V.], kand.tekhn.nauk

Rare metals. Nauka i zhyttia 8 no.3:9-12 Mr '58.
(MIRA 12:9)

(Metals, Rare and minor)

SAMSONOV, G.V.

Magnesium-thermal production of boron carbide. Ukr.khim.zhur. 24 no.6:799-804 '58. (MIRA 12:3)

1. Institut metallokeramiki spetsplavov AN USSR.
(Boron carbides)

SAMSONOV, G. V.

79-1-59/63

AUTHORS: Funke, V. F., Samsonov, G. V.

TITLE: Synthesis and Some Properties of Silicon Nitride (Polucheniye i nekotoryye svoystva nitrida kremniya)

PERIODICAL: Zhurnal Obshchey Khimii, 1958, Vol.28, Nr 1, pp.267-272(USSR)

ABSTRACT: Three silicon nitrides were described in publications: Si_3N_4, Si_2N_3 and SiN (reference 1), but unequivocally the existence was only proved of Si_3N_4 (39,8 % nitrogen). According to the radiographic and electronographic analysis Si_3N_4 possesses a rhombic lattice with periods: a = 13,38 ± 0,03, b = 8,60 ± ± 0,2, c = 7,74 ± 0,02"A. Its specific gravity is 3,17 - - 3,44 gr/cm^3 and its melting point 1900°C. It is chemically of an extraordinary stability: hydrochloric, sulfuric, nitric and phosphoric acid of different concentrations in 500 hours treatment, chlorine at 900°C, H_2S at 1000°C, boiling 25 % soda lye are not capable of influencing this silicon nitride in any way. It is only under the influence of hydrofluoric acid that a decomposition takes place. It is well

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79-1-59/63

Synthesis and Some Properties of Silicon Nitride

resistant to molten metals: in molten aluminum (at 1000°C) it takes 100 hours to bring it to decomposition, in lead (at 400°C) 144 hours, in zinc (at 550°C) 500 hours, in magnesium (at 750°C) 20 hours. It is only in contact with molten copper that a corrosion markedly sets in. Regarding atmospheric oxidizability it also surpasses many an otherwise resistant compound. In the present paper two syntheses of silicon nitride described in publications were checked: 1) the azotation of the mixture of silica and charcoal in the nitrogen atom at elevated temperature and 2) the direct azotation of elementary silicon, also at high temperature. The latter was performed at 970 - 1600°C. The authors approximatly determined the reaction constant of the azotation and the activation energy in the reaction diffusion of nitrogen into silicon under formation of the phase Si_3N_4 (33800 ± 719 cal.mol). The authors calculated the microhardness of Si_3N_4. The solubility of nitrogen in silicon is low. The homogeneity-domain of the phase Si_3N_4 could not be determined. There are 4 figures, 2 tables, and 8 references, 2 of which are Slavic.

Card 2/3

79-1-59/63

Synthesis and Some Properties of Silicon Nitride

ASSOCIATION: All-Union Scientific Institute for Solid Alloys (Vsesoyuznyy nauchno-issledovatel'skiy institut tverdykh splavov)

SUBMITTED: December 21, 1956

AVAILABLE: Library of Congress

Card 3/3 1. Chemistry 2. Silicon nitrides-Synthesis 3. Silicon nitrides-Properties

KOLOMOYETS, N.V.; NESHPOR, V.S.; SAMSONOV, G.V.; SEMENKOVICH, S.A.

Thermoelectric properties of certain metal like compounds.. (MIRA 12:1)
Zhur. tekh. fiz. 28 no.11:2382-2389 N '58.
(Carbides) (Borides) (Thermoelectricity)

68264
SOV/81-59-10-34180

15.2220

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 10, p 50 (USSR)

AUTHORS: Meyerson. G.A., Samsonov, G.V., Kotel'nikov, R.B., Voynova, M.S., Yevteyeva, I.P., Krasnenkova. S.D.

TITLE: Some Properties of Alloys in the Systems TiB_2 - CrB_2, TiB_2 - W_2B_5 and ZrB_2 - CrB_2

PERIODICAL: Sb. nauchn. tr. Nauchno-tekhn. o-vo tsvetn. metallurgii, Mosk. in-t tsvetn. met. i zolota, 1958, Nr 29, pp 323-338

ABSTRACT: In the alloys of the systems: TiB_2 - CrB_2, TiB_2 - W_2B_5, ZrB_2 - CrB_2 the microstructure, the microhardness, the specific electric conductivity, the mechanical properties, the kinetics of the oxidation in the air at 1,000°C have been investigated and an X-ray analysis has been carried out. The samples were prepared by the method of hot pressing at temperatures of up to 2,500°C and P 100 - 200 kg/cm^2, homogenizing tempering was carried out at 2,000 - 2,100°C in the course of 3 - 4 hours. The one-phase structure of the alloys of the sytem TiB_2 - CrB_2 and the two-phase structure of the alloys TiB_2 - W_2B_5 and ZrB_2 - CrB_2 have been established. The high microhardness of the alloys of all investigated systems (up to 4,200 kg/mm^2 in

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68264

SOV/81-59-10-34180

Some Properties of Alloys in the Systems TiB_2 - CrB_2, TiB_2 - W_2B_5 and ZrB_2 - CrB_2

the alloys of the system CrB_2 with 80 molecular % of TiB_2) has been noted. The oxidation process is well described by the formula: $\Delta G = At^n - Bt$, where $n \approx 0.5$. The heat resistance of the borides (during short exposures) increases in the series: W_2B_5 - - TiB_2 - ZrB_2 - CrB_2.

L. Viting

Card 2/2

80306
SOV/81-59-7-22494

18.6100
Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 7, p 59 (USSR)

AUTHOR: Samsonov, G.V.

TITLE: The Phases of the Tungsten-Boron System

PERIODICAL: Sb. nauchn. tr. Nauchno-tekhn. o-vo tsvetn. metallurgii, Mosk. in-t tsvetn. met. i zolota, 1958, Nr 29, pp 356 - 360

ABSTRACT: The W-B system was investigated by the methods of hardness and X-ray analysis. Mixtures with various W:B ratios were sintered by the method of hot pressing with subsequent long-lasting annealing at 1,900°C and cooling. The apparent specific gravity of the sintered samples, the hardness and the chemical composition were determined, the microstructure was studied and an X-ray phase analysis was carried out. The following phase regions of the W-B system (from 1 to 70 - 80 atomic % B) were elucidated and precisely determined: α, the region of limited solid B solution in α-W, the two-phase $\alpha + \gamma$ region (γ-phase, W_2B, has a very narrow homogeneity region), the two-phase $\gamma + \delta$ region (W_2B + WB), the

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80306

The Phases of the Tungsten-Boron System SOV/81-59-7-22494

homogeneity region of the δ -phase from 44.4 to 50 - 55 atomic % B, the two-phase δ + ε region (WB + W_2B_5), the homogeneity region of W_2B_5, 68 - 75 atomic % B. The relatively low hardness of the γ -phase is connected with the isolated position of the B atoms in the elementary nucleus. The maximum hardness has the δ -phase with B atoms joined into zigzag chains.

A. Zolotarevskiy

Card 2/2

69394

SOV/137-59-4-8394

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 4, p 151 (USSR)

24.2140

AUTHORS: Samsonov, G.V., Neshpor, V.S.

TITLE: On Superconductivity of Borides, Carbides, Nitrides and Silicides of Transition Metals

PERIODICAL: Sb. nauchn. tr. Nauchno-tekhn. o-va tsvetn. metallurgii, Moscow, in-t tsvetn. met. i zolota, Nr 29, pp 361 - 366 - 1958

ABSTRACT: The authors analyze literature data on critical temperatures T_c in the transition to the superconducting state of silicides, borides, carbides and nitrides of transition metals. The values of T_c for MeSi, MeB, MeC and MeN compounds are connected with the dispersing (accepting) capacity of the metal atom and the magnitude of the ionization potential of the metalloid. The dispersing capacity of atoms of transition metals is approximately characterized by the 1/nN ratio, where n is the number of electrons in the incomplete d-level of the metal atom, and N is the main quantum number of the level. A decrease of the 1/nN number in the transition from Ti, Zr, V, Hf to Ta, Nb, W, Mo, i.e., from 0.167 - 0.100 to 0.05 - 0.067, is accompanied by a sharp increase in T_c of the

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SOV/137-59-2-4081

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 2, p 253 (USSR)

AUTHORS: Samsonov, G. V., Kiparisov, S. S.

TITLE: Technique for the Metallographic Investigation of Boron Carbide (Tekhnika metallograficheskogo issledovaniya karbida bora)

PERIODICAL: Sb. nauchn. tr. Nauchno-tekhn. o-vo tsvetn. metallurgii, Mosk. in-t tsvetn. met. i zolota, 1958, Nr 29, pp 367-371

ABSTRACT: The authors present a survey and analysis of the existing methods of preparation and etching of microsections (M) of compact B_4C specimens. Results are described of the investigation of the feasibility of using powdered boron carbide for polishing and the anodic method for etching of the specimens of B_4C. It is established that by successive polisihing with two size fractions of B_4C powder it is possible to attain a sufficiently smooth finish of the M even though at the expense of a somewhat longer time (~ 2 hours), without using the expensive diamond powder. The M preparation method consists of the following: On the specimen an area is ground out with a carborundum wheel, the operation requiring 10 - 15 min at 1750 rpm. The area is treated with 50 - 70 μ B_4C powder applied in the form of a

Card 1/2

Technique for the Metallographic Investigation of Boron Carbide

thick slurry in kerosene or machine oil on a cast iron disc rotating at the rate of 1000 rpm. This treatment requires 25 - 30 min. The second treatment with 5 - 7 μ B_4C powder also on a cast iron disc requires 1 - 1.5 hours. The ground surface is buffed with a cloth disc with a suspension of Al oxide in water. In order to bring out the structure of B_4C the M is treated by anodic etching in a 20% aqueous KOH-solution bath with a Cu cathode. The structure is brought out with sufficient distinctiveness after 5 - 10 sec of etching with an anode cd of 5 - 10 amp/mm^2 and a potential of 8 - 10 v. In conclusion a method for the preparation of B_4C powder microsections is described. Bibliography: 9 references.

V. N.

SAMSONOV, G.V., kand. tekhn. nauk

White graphite. Visnyk AN URSR 29 no. 5:66-68 My '58. (MIRA 11:7)
(Boron nitride)

SAMSONOV, G.V.; POPOVA, N.M.; TIKHOMIROVA, L.I.

Preparation of cerium monosulfide. Zhur. prikl. khim. 31 no.2: 153-157 F '58. (MIRA 11:5)

(Cerium sulfides)

KOVAL'CHENKO, M.S.; NESHPOR, V.S.; SAMSONOV, G.V.

Condition for formation of lanthanum carbide. Zhur. prikl. khim. 31 no.9:1427-1429 S '58. (MIRA 11:10)
(Lathanium carbide)

SOV/ 76-32-6-21/46

AUTHORS: Neshpor, V. S., Samsonov, G. V.

TITLE: New Borides of Rare Earth Metals (Novyye boridy redkozemel'nykh metallov)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 6, pp 1328-1332 (USSR)

ABSTRACT: After a discussion of papers and discoveries in this field this paper gives the results of the measurements as well as the production of borides from Dy_2O_3, Ho_2O_3, Lu_2O_3, Gd_2O_3 and Er_2O_3. The production was carried out from the mentioned oxides with boron carbide at 1400-1600° C in vacuum furnaces; the phases of the obtained products were identified and the corresponding formulae were determined as follows: GdB_6, DyB_6, HoB_6, ErB_6, LuB_6 and GdB_4, DyB_4, HoB_4, ErB_4, LuB_4. The authors found that the metal is in bivalent form in the case of CaB_6, BaB_6, SrB_6, YB_6 and ErB_6, while it is in trivalent form in the other hexaborides of the rare earth metals. This was determined from the obtained values of the lattice parameters of hexaborides as well

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New Borides of Rare Earth Metals

as from the lenghts of the bindings Me-Me, Me-B, and B-B calculated herefrom. It was noticed that the Me-Me and Me-B bindings decrease in every period at the transition from the bi- to the trivalent metal, and that the weakening of the bond in hexaborides can be explained by an increased concentration of the free electrons which weaken the lattice. The stability of the lattice MeB_6 is due to an especially strong binding of the boron atoms. The assumption is made that the formation of a hexaboride is possible also with elements with a higher ionization potential; this is, however, connected with difficulties as was shown by the experiments for the formation of silicon hexaboride. There are 1 figure, 3 tables, and 21 references, 11 of which are Soviet.

ASSOCIATION: Akademiya nauk, USSR Institut metallokeramiki i spetssplavov, Kiyev (Kiyev, Institute of Metal Ceramics and Special Alloys, AS Ukr[illegible] SSR)

SUBMITTED: February 14, 1957

5(4)18(6)
AUTHOR: Samsonov, G. V. SOV/76-32-10-29/39

TITLE: The Present State of Investigation of the Boron-Carbon Diagram (Sovremennoye sostoyaniye issledovaniya diagrammy sistemy bor-ugler...)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 10, pp 2424-2429 (USSR)

ABSTRACT: First the following papers are mentioned as they concern the field mentioned in the title: Moissan (Muassan) (Ref 1), Mühlhauser (Myul'gauzer) (Ref 2), Podszus (Podstsus) (Ref 3), Ridgway (Ridzhvey) (Ref 4), I. G. Shafran, B. F. Ormont, and A. I. Zolotorevskiy (Ref 5), G. A. Meyerson and G. V. Samsonov (Ref 6), G. S. Zhdanov and Sevast'yanov (Ref 9), Clark and Hoard (Klerk and Kherd) (Ref 10), G. S. Zhdanov, N. N. Zhuravlev, and L. S. Zevin (Ref 11), Dawihl and Elüshöh (Davil and Flyuskh) (Ref 13), Glaser, Moskowitz, and Post (Glazer, Moskovich, and Post) (Ref 15), and Allen (Ref 16). Investigations of the boron-carbon system were carried out by the author of the present paper together with N. N. Zhuravlev and I. G. Amnuel' to explain the contradicting data. An alloy with 5.11 percent by weight C showed a crystal

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lattice different from that of pure boron. The micro-hardness of the alloys (measured with the apparatus ПМТ-3) increased with the carbon content from 5.11 to 17.47 percent by weight C, and then dropped again. On the addition of 2-3 % carbon the boron forms a boron eutectic, or the solid solution of carbon in boron carbide $B_{13}C_2$, respectively. The eutectic has a defective lattice, i.e. empty spaces at the -C-B-C- line of the carbide $B_{13}C_2$. The boron carbide $B_{13}C_2$ can convert to the carbide $B_{12}C_3$, with the lines -C-C-C- being formed instead of the -C-B-C- lines. $B_{12}C_3$ forms a eutectic with carbide B_nC_m , which probably corresponds to the formula BC_2 . This high-carbon carbide apparently is formed in the peritectic reaction $B_nC_m \rightleftharpoons B_4C + C$. A hypothetical diagram of the system B - C within the range of 60-70 percent by weight C was plotted. A false observation in the paper by V. A. Epel'baum, M. A. Gurevich, and B. F. Ormont (Ref 19) is corrected and the paper by Podszus (Ref 3) is mentioned. In melting B_4C a peritectic decomposition takes place. The continuous transition from phase $B_{13}C_2$ to phase $B_{12}C_3$ is

doubtful. The physical processes are not the same in the formation of these phases. $B_{13}C_2$ is formed by a filling of empty spaces by carbon atoms, the phase $B_{12}C_3$ is formed by a substitution of the boron atoms with carbon atoms. For this reason a new "Compromise Diagram" of the B - C system of 0-80 percent by weight C is given. The diagram shows: the α phase - the solid solution of carbon in boron, the β phase - rhombohedral phase of the limit composition $B_{13}C_2$, β' phase - rhombohedral phase of the limit composition $B_{12}C_3$, and the γ phase - a high carbon carbide with a content of 68-69 percent by weight C . There are 4 figures and 19 references, 10 of which are Soviet.

ASSOCIATION: Akademiya nauk USSR,Institut metallokeramiki i spetssplavov, Kiyev (Academy of Sciences UkrSSR, Institute of Metallo-ceramics and Special Alloys, Kiyev)

SAMSONOV G. V.

AUTHORS: Neshpor, V. S., Paderno, Yu. B., Samsonov, G. V. 20-3-27/59

TITLE: On Rhenium Borides (O boridakh reniya).

PERIODICAL: Doklady AN SSSR, 1958, Vol. 118, Nr 3, pp. 515-516 (USSR)

ABSTRACT: In the present work the phase composition of Re-B alloys was investigated as there is practically no reference to be found in publications (with the exception of a short mentioning in ref. 1). These compounds are first of all of interest as they might be similar to the stable, difficultly smeltable and hard tungsten borides (ref. 2) as well as to the unstable manganese borides. Alloys were investigated which had been calculated with a view of producing compounds, existing in the systems of metals similar to rhenium as regards their electron structure and their properties. They were

Re_4B, Re_2B, Re_3B_2, ReB, Re_3B_4, Re_2B_3, ReB_2 and Re_2B_5.

The alloys were produced by sintering pressed powder mixtures (ref. 4) at 1900° for two hours. The radiograms of the alloys taken by copper radiation are given in fig.1. No

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On Rhenium Borides

There are 1 figure, and 6 references, 4 of which are Slavic.

ASSOCIATION: Institute for Metal Ceramics and Special Alloys AN USSR (Institut metallokeramiki i spetssplavov Akademii nauk Ukr. SSR).

PRESENTED: September 20, 1957, by I. I. Chernyayev, Academician

SUBMITTED: September 18, 1957

AVAILABLE: Library of Congress

20-119-3-30/65

AUTHORS: Samsonov, G. V., Dzeganovskiy, V. P., Semashko, I. A.

TITLE: Europium Hexaboride (Geksaborid yevropiya)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 3, pp. 506-507 (USSR)

ABSTRACT: The hexaborides of the rare earth MeB_6 are at present rather well investigated (ref 1). They are used in electronics because of their high thermo-emission characteristics. The boride mentioned in the title was, however, neither synthetized nor investigated. Pure europium oxide was produced by a hexaboride reduction:

$$Eu_2O_3 + 3B_4C = 2EuB_6 + 3CO.$$

The reaction took 2 hours in vacuum at 1650°C. The product a dark-grey powder, corresponded exactly to the formula at a C-content below 0,02 %. A radiographic structure investigation showed a cubic lattice with a lattice parameter of

$$a = 4,167 \pm 0,002 \text{ Å}.$$

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Europium Hexaboride

Figure 1 gives a line diagram of the radiograph in question, whereas table 1 comprises the corresponding numerical data. The radio density computed from the lattice period amounts to

$$4,99 \pm 0,01 \text{ g/cm}^3.$$

The obtained value of the lattice period confirms the assumption (ref 2) concerning the agreement between the variation curves of the atom radius of the rare earths and the lattice periods of the borides of these metals, as well as the final conclusions on the positive effective three valence of all elements of the rare earths in compounds, except europium and ytterbium which have a bi-valent character (figure 2). For the construction of the curve of lattice parameters beside EuB_6 also the period values of DyB_6, HoB_6 and LuB_6 (ref 3) were exploited. Here the value of the lattice parameters for erbium (ref 6) was assumed somewhat too low. The accordance to certain rules indicated here admits doubts concerning the correctness of the value in question for ytterbium hexaboride (ref 7),

Europium Hexaboride

since it is necessary to define it exactly. The same value is in the case of EuB_6 in strict agreement with the mentioned rules.
There are 2 figures, 1 table, and 8 references, 4 of which are Soviet

ASSOCIATION: Institute metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute of Metallic Ceramics and Special Alloys AS Ukrainian SSR)

PRESENTED: November 28, 1957, by I. I. Chernyayev, Member, Academy of Sciences USSR

SUBMITTED: November 20, 1957

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SOV/2o-122-6-18/49

9(3), 24(3)

AUTHORS: Samsonov, G. V., Neshpor, V. S.

TITLE: On the Relationship Between the Work Electron Yield From Hexaborides of Alkali-Earth and Rare-Earth Metals and Their Electron Structure (O svyazi raboty vykhoda elektronov iz geksaboridov shchelochno-i redkozemel'nykh metallov s ikh elektronnym stroyeniyem)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 6, pp 1o21-1o23 (USSR)

ABSTRACT: Recently, the parameters of the thermoelectronic emission of nearly all hexaborides of earth-alkali metals and rare earth metals have been investigated. A diagram (Ref 4) shows the dependence of the work function of hexaborides of rare earth metals MeB_6 on the nuclear charge number of their metal components (according to data obtained by G. A. Kudintseva and B. M. Tsarev). The character of this dependence can be explaind satisfactorily by the theory of the atomic structure of rare earth metals developed by M. A. Yel'yashevich (Ref 5) as well as by the theories developed by various authors concerning hexaboride electron structure. The production of hexa-

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On the Relationship Between the Work of Electron Yield From Hexaborides of Alkali-Earth and Rare-Earth Metals and Their Electron Structure

borides is connected with the double ionization of metal atoms and with the transfer of 2 external s-electrons by a boron atom. In this way 5 covalent bonds are produced in the boron octahedra and between them. Reference is made to several earlier papers dealing with this subject. Next, binding between metal atoms and boron atoms is brought about by means of an electron collective, which is formed by the electrons of normal or excited d-orbits and partly also by such electrons as belong to the s-orbits of the metal as are not utilized for binding with boron. It is necessary, in the hexaborides of rare earth metals to investigate two systems of energy bands, viz. the narrow only slightly excited 4f-band and the comparatively broad hybride 5d-6d-band. The latter must determine electric conductivity and the work function of the electrons from the hexaborides under investigation. Several details are then dealt with. The above mentioned diagram also shows the number of possible terms for 4 f-electrons as function of the nuclear charge number of the metals, which were calculated according to the rule

Card 2/3 $kf^n = kf^{14-n}$ (where k denotes the number of terms). The maximum

On the Relationship Between the Work of Electron Yield From Hexaborides of Alkali-Earth and Rare-Earth Metals and Their Electron Structure

multiplicity and consequently also the highest degree of electron bound state and the lowest degree of probability of f-d-transitions according to this curve corresponds to Eu and Gd. A comparison of the curves for the dependence of the work function φ and the number k of terms on the nuclear charge number actually confirms their qualitative similarity. Finally, some particular features are pointed out. There are 1 figure, 1 table, and 15 references, 9 of which are Soviet.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute for Metal Ceramics and Special Alloys of the Academy of Sciences, UkrSSR)

PRESENTED: June 6, 1958, by S. A. Vekshinskiy, Academician

SUBMITTED: June 5, 1958

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PHASE I BOOK EXPLOITATION SOV/3460

18(2)

Samsonov, Grigoriy Valentinovich

Silitsidy i ikh ispol'zovaniye v tekhnike (Silicides and Their Industrial Utilization) Kiyev, Izd-vo AN Ukrainskoy SSR, 1959. 203 p. Errata slip inserted. 3,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov.

Ed.: I.N. Frantsevich, Corresponding Member, Ukrainian SSR Academy of Sciences; Ed. of Publishing House: K.I. Lazebnik; Tech. Ed.: A.A. Matveychuk.

PURPOSE: This book is intended for scientific workers and advanced students interested in metallurgy and the chemistry of refractory compounds.

COVERAGE: This book discusses the principles of the crystallochemistry of silicides, their structural types, electron structure, thermodynamic properties, questions of the diffusion forma-

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Silicides and Their (Cont.)

tion of silicide phases during the silicifying of metals, chemical properties, mechanism of oxidation, and questions of hardness and durability in comparison with other metallic compounds. All presently known systems of silicon with other elements are described and the mechanical, physical, chemical, and other properties of silicide phases are outlined. The uses of silicides in industry are discussed. The author thanks V.S. Neshpor, T.Ya. Kosolapov, Yu.B. Paderno, R. Kiffer, and B. Aronsson. There are 479 references, of which 108 are Soviet.

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18.(0) PHASE I BOOK EXPLOITATION SOV/3212

Samsonov, Grigoriy Valentinovich, and Vladimir Ivanovich Konstantinov

Tantal i niobiy (Tantalum and Niobium) Moscow, Metallurgizdat, 1959.
264 p. Errata slip inserted. 3,150 copies printed.

Reviewers: N. S. Nikolayev, Doctor of Chemical Sciences; A. I. Vaysenberg, Candidate of Technical Sciences; and O. P. Kolchin, Candidate of Technical Sciences; Eds.: A. I. Vaysenberg and O. P. Kolchin; Ed. of Publishing House: M. S. Arkhangel'skaya; Tech. Ed.: Ye. B. Vaynshteyn.

PURPOSE: This book is intended for engineers and research workers in the metallurgical, chemical, electrical, electronics, and other industries engaged in the production or use of tantalum, niobium, and their alloys. It may also be used as a textbook by students at metallurgical schools of higher education.

COVERAGE: The book deals very generally with tantalum and niobium. The properties, applications, geochemistry, minerals and ores, processing, metallurgy, forming, and machining of these elements are discussed. Their alloys, including metallic and nonmetallic components, are also dealt with, the information being based on experimental work conducted by the authors and on published material. Aspects of ore beneficiation, analytical chemistry,

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SAMSONOV, G.V.

PHASE I BOOK EXPLOITATION SOV/3624

Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov

Metallokeramicheskiye materialy i metody ikh issledovaniya; informatsionnyye materialy (Cermet Materials and Methods of Their Analysis; Information Material) Kiyev, Izd-vo AN UkrSSR, 1959. 55 p. 1,500 copies printed.

Ed. of Publishing House: I.V. Kisina; Tech. Ed.: A.M. Lisovets Editorial Board: I.N. Frantsevich, I.M. Fedorchenko, G.S. Pisarenko, G.V. Samsonov (Resp. Ed.), V.N. Yeremenko, and V.N. Paderno.

PURPOSE: This collection of articles is intended for scientific workers, designers, and engineering and technical workers in the metallurgical, machinery-manufacturing and other branches of industry.

COVERAGE: In this collection of articles the authors describe the production of carbides, nitrides and other heat resisting compounds, giving their physicochemical and mechanical properties. Their thermal processing and the processing installations are also described. A new method is proposed for the production of rods from refractory compounds. Certain compounds are analyzed, and the energy dissipation in materials during high-frequency mechanical vibrations is determined. No personalities are mentioned. There are 7 schematic drawings, 7 diagrams, 6 tables and 17 references, 16 of which are Soviet.

Fedorchenko, I.M., and Yu.B. Yermolovich. Installation for Determining the Kinetics of Evaporation and the Vapor Tension of Metal Powders 13

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Yeremenko, V.N., and T.Ya. Velikanova. Conditions for Preparing Alloys of Titanium Carbide With Molybdenum 25

Klibus, A.Kh. Determination of Small Quantities of Nitrogen in Titanium Carbide 27

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Verkhoglyadova, T.S. Preparation of Titanium Nitride From Titanium Sponge 45

Kugay, L.N., and O.G. Seraya. Analysis of Vanadium Silicide 46

Pen'kovskiy, V.V., and G.V. Samsonov. New Method of Preparing Bars From High-Melting Compounds 50

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SAMSONOV, G. V.

[redacted]

18(0) PHASE I BOOK EXPLOITATION SOV/2316

Akademiya nauk SSSR. Institut nauchnoy i tekhnicheskoy informatsii

Metallurgiya SSSR, 1917-1957; [t.] II (Metallurgy in the USSR, 1917 - 1957; Vol 2) Moscow, Metallurgizdat, 1959. 813 p. Errata slip inserted. 3,000 copies printed.

Ed. (Title page): I. P. Bardin, Academician; Ed. (Inside book): G. V. Popova; Tech. Ed.: P. G. Islent'yeva.

PURPOSE: This book is intended for metallurgists.

COVERAGE: The articles in this collection present historical data on the achievements of Soviet metallurgy, both ferrous and nonferrous, during the period 1917-1957. Advances in theory and practical application are thoroughly discussed. Many of the articles describe the present status of individual branches of metallurgy and give an idea of what may be expected in the future. Advances made in other countries are also discussed. The articles are accompanied by a large number of references. For further coverage, see Table of Contents.

Pinkhusovich, Candidate of Technical Sciences; and A. G. Nikonov, Candidate of Technical Sciences. (Institute of Metallurgy imeni A. A. Baykov, USSR Academy of Sciences) Achievements in Railroad Wheel and Tire Production 101

Changes in engineering specifications and improvements in production techniques and quality of tires and solid wheels in the USSR since 1940 are discussed. Further progress in this field is predicted.

Zimin, A. I., Professor, Doctor of Technical Sciences. (MVTU) Forging and Stamping Methods 113

This is a historical survey of developments in forging and stamping processes in Russia from prerevolutionary times up to 1957.

Levi, L. I. Candidate of Technical Sciences. (Moscow Institute of Machine Design) Production of Castings 141

The paper traces the general course of development and discusses problems in the theory of casting, casting alloys, basic melting processes, molding and core materials, nonmetallic molds, special casting methods (permanent mold casting, die casting, continuous casting, centrifugal casting, investment casting, etc.), equipment, mechanization, and automation.

Bal'shin, M. Yu., Candidate of Technical Sciences; and G. V. Samsonov, Candidate of Technical Sciences. (Institute of Metallurgy imeni A. A. Baykov, USSR Academy of Sciences; and Institute of Powder Metallurgy, Ukrainian Academy of Sciences) Powder Metallurgy 175

The article is a general survey of the development and present state of powder metallurgy in the USSR. Theoretical and practical aspects of the preparation of cemented and sintered metal products are discussed.

Rykalin, N. N., Corresponding Member, USSR Academy of Sciences; N. O. Okerblom, Professor, Doctor of Technical Sciences; A. A. Yerokhin, Candidate of Technical Sciences; and M. Kh. Shorshorov, Candidate of Technical Sciences. (Institute of Metallurgy imeni A. A. Baykov, USSR Academy of Sciences; and Leningrad Polytechnic Institute) Progress in the Science of Welding Metals in the USSR 194

The authors discuss the studies that have been made in the USSR of the theoretical aspects of welding, beginning in the latter part of the nineteenth century. Specific topics are: investigation of the arc,

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SAMSONOV, G.V.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

Savitskiy, V.G., and K.V. Popov. Study of Certain Problems of the Temperature Dependence of the Plasticity of Steel From the Viewpoint of the Dislocation Theory 150

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SOV/21-59-1-9/26

18(0)

AUTHORS: Samsonov, G.V., Koval'chenko, M.S., Verkhoglyadova, T.S.

TITLE: Diffusion of Silicon in Titanium, Tantalum, Molybdenum and Iron (Diffuziya kremniya v titan, tantal, molibden i zhelezo)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, Nr 1, 1959, pp 32-36 (USSR)

ABSTRACT: The authors tell of their study of the diffusion of silicon in the surface of metals, to form protective coatings thereon. Experiments were made on specimens of 99.98% titan, 99.98% molybdenum, ARMCO-iron and 99.6% Ta, 0.4% Nb tantal. Silicon was purified by the method described in reference [8]. The specimens were treated with silicon in an argon atmosphere, in a solid-phase bath consisting of 97% Si and 3% NH_4Cl. Ammonium chloride was introduced into the mixture to create $SiCl_4$, which accelerates the diffusion and educes

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Diffusion of Silicon in Titanium, Tantalum, Molybdenum and Iron

gaseous HC l, which pickles the metal surface and facilitates the diffusion. The specimens were subjected to saturation at 600-1200°C, at intervals of 100° C, during a period of four hours. It was established that the relative change in weight, height $\frac{\Delta p}{p}$ of specimens depends on the absolute temperature and time of saturation, as expressed by the empiric equation $\frac{\Delta p}{p} = \sqrt{A\tau}\, e^{-\frac{B}{T}}$, wherein $\frac{p}{p}$ is the relative change in weight, diameter or height, τ is the time of saturation, T is the absolute temperature, A and B are constants determined experimentally. The experiments showed that at low temperature, a single-layer silicon coating appeared at a high temperature. (1000-1200°C) a double-layer silicon coating appeared. The thicker the silicon layer, the harder the surface.

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Diffusion of Silicon in Titanium, Tantalum, Molybdenum and Iron

The principal formations of phases TiSi, $TaSi_2$, Mo_3Si_2 and FeSi were determined, along with the coefficients and activation energy quantities of the diffusion of the above named metals. The results of the study are presented in a table. There are one table, one graph and 12 references, 9 of which are Soviet, 2 English and 1 German.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR (Institute of Metal-Ceramics and Special Alloys of AS UkrSSR)

PRESENTED: September 17, 1958, by V.N. Svechnikov, Member of the AS UkrSSR

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SOV/21-59-1-12/26

18(7)

AUTHORS: Samsonov, G.V. and Kislyy, P.S.

TITLE: A New Method of Making Pipes and Rods of Heat-Resistant Powder Metals and Their Compounds (Novyy sposob izgotovleniya trub i sterzhney iz poroshkov tugoplavkikh metallov i ikh soyedineniy)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 1, pp 46-48 (USSR)

ABSTRACT: This new method of making pipes or solid (without hole) bodies of heat-resistant and non-plastic metal powders or their compounds such as carbides, nitrides, borides, silicides, or sulfides, consists in pressing them in a mold, with the use of a punch with a central rod (for making pipes) or without such a central rod (for making solid bodies). The metal powder is mixed with 2-4% starch paste, which is the best plasticizer for this purpose. The pressed bodies are sintered

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A New Method of Making Pipes and Rods of Heat-Resistant Powder Metals and Their Compounds

in an electric resistance oven at 600-700° C, for 1/2 hour, and are then heated to a clinkering temperature for 5-10 hours, whereupon the furnace and works are cooled gradually to 900-1000° C. Shrinkage averages 12-20%. Porosity changes from 5 to 12%. There are 1 diagram and 5 Soviet references.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN UkrSSR (Institute of Metal-Ceramics and Special Alloys of AS Ukr SSR).

PRESENTED: September 27, 1958, by V.N. Svechnikov, Member of the AS UkrSSR

AUTHORS: Kosolapova, T.Ya. and Samsonov, G.V. SOV/80-59-1-9/44

TITLE: Manufacture of Higher Chromium Carbide (Prigotovleniye vysshego karbida khroma)

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Nr 1, pp 55-60 (USSR)

ABSTRACT: As the obtaining of pure chromium carbide without admixtures of free carbon and lower carbides presented certain difficulties, the authors undertook an investigation for studying the conditions of Cr_3C_2 manufacture. For this purpose was used the reaction of reducing the chromium oxide with carbon taken in an excess necessary for the forming of carbide and removing of oxygen. The experiments carried out to find out the conditions for obtaining a minimum amount of lower carbides and free carbon have shown that the optimum procedure is as follows: briquets made of the mixture of stoichiometric composition are heated at 1,400 to 1,500°C in a hydrogen stream during 30 minutes in the case of 10 to 15 g briquets or during 1 hour for briquets weighing 200 to 300 g. The reaction which takes place looks like this: $3Cr_2O_3 + 13C = 2Cr_3C_2 + 9CO$. An increased or reduced content of carbon in the mixture negatively affects the chemical and phase content of the carbide.

Card ~~1/2~~

Submitted June 1957

SOV/136-59-2-13/24

AUTHOR: Samsonov, G.V.

TITLE: Some Important Fields for the Application of Compounds of Rare-Earth Elements (Nekotoryye vazhnyye oblasti ispol'zovaniya soyedineniy redkozemel'nykh elementov)

PERIODICAL: Tsvetnyye Metally, 1959, Nr 2, pp 58-59 (USSR)

ABSTRACT: The author states that the applications of the high-melting compounds of rare-earth elements have been neglected in the literature and goes on to discuss some of them briefly. He deals with borides of the general type MeB6, oxides, sulphides and silicides. He recommends that more attention should be paid to these compounds by metallurgists and economists, that their production should be centrally organised and that accumulated experience in their use should be disseminated. Most of the references given are of papers of the author jointly with others. There are 20 references of which 19 are Soviet and 1 English.

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SOV/180-59-2-23/34

AUTHORS: Portnoy, K.I., Samsonov, G.V., and Frolova, K.I. (Moscow, Kiyev)

TITLE: Alloying Boride Alloys with Silicon (Legirovaniye boridnykh splavov kremniyem)

PERIODICAL: Izvestiya akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959,Nr 2,pp 117-121 (USSR)

ABSTRACT: Alloying with silicon or silicides has been shown by two of the authors (Ref 6) to be effective in increasing the resistance of borides to oxidation. The authors now discuss some boride systems and describe their experiments which had the aim of studying the influence of additions of molybdenum and tungsten silicides and also elementary silicon on the resistance to oxidation of the double boride (Ti, Cr) B_2 with a molar ratio TiB_2 : CrB_2 = 4 : 1. This material has good mechanical and non-scaling properties (Refs 9, 10) and is an important component of technical borides. The alloys were prepared from mixtures of powders of the double-boride with those of the additions by hot compression followed by prolonged high-temperature annealing and slow cooling. Cylindrical test pieces 8 - 14 mm in diameter and 6 - 10 mm long, were used. These were subjected to metallographic and

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Alloying Boride Alloys with Silicon

X-ray investigation. Oxidation in air was studied by the weighing method at 1000, 1100 and 1200 °C. Resistance to oxidation was increased several fold by additions of molybdenum disilicide; 15-20 wt.% being satisfactory. Table 1 shows the gains in weight for materials with 5% silicon after various heating times, while Fig 1 shows these values and those for tungsten silicide, and for silicon at 1200 °C as functions of heating time. The results showed that the protective effect of silicon was approximately the same whether it had been added as the element or as silicide. The extent of oxidation of silicon-containing borides was small at 1000 - 1200 °C in 100 hours (Table 2 and Fig 4). When the density of specimens decreased additions of molybdenum silicide increased resistance to oxidation, while additions of silicon reduced it. The authors explain this effect in terms of the different behaviour of the materials on evaporation. Electron diffraction study by I.A. Ponizovskaya of oxide films obtained at 1200 °C in 5 hours showed that they are amorphous. The authors stress

SOV/180-59-2-23/34

Alloying Boride Alloys with Silicon

that in alloying with silicon or silicides the effect on density and mechanical properties must be borne in mind.

There are 4 figures, 3 tables and 10 references,
Card 3/3 9 of which are Soviet and 1 German.

SUBMITTED: December 16, 1958

06400
SOV/170-59-2-18/23

5(2); 28(5)

AUTHORS: Samsonov, G.V., Neshpor, V.S., Serebryakova, T.I.

TITLE: The Increase in Electric Resistance of Directly Heated Cathodes Made of Borides of Rare-Earth Metals

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1959, Nr 2, pp 118-120 (USSR)

ABSTRACT: The use of thermal cathodes made of hexaborides of lanthanum, cerium and yttrium has been expanded in the recent time, but still it is hampered by their relatively low electric resistance. One of the possible ways of increasing their electric resistance is the use of their alloys instead of individual borides [Ref 2]. The authors prepared alloys of hexaborides of lanthanum and cerium by hot pressing the mixture of their powders under a pressure of 150 kg/cm^2 and at temperatures of 1,600 to 2,000°C. The sintered samples were subjected by an X-ray analysis in the RKE chamber, and the data obtained are presented in Table 1. The roentgenograms do not reveal characteristic lines of individual borides but two lines of their solid solution are observed. The specific electric resistance of the solid solutions of some borides is shown in the form of curves,

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SOV/170-59-2-18/23

The Increase in Electric Resistance of Directly Heated Cathodes Made of Borides of Rare-Earth Metals

electric resistance versus concentration, in Figure 1. It was found that alloys of hexaborides of lanthanum and cerium are most advantageous, among all the alloys investigated, for the use in directly heated cathodes. There are: 1 table, 1 graph and 3 references, 2 of which are Soviet and 1 American.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN USSR (Institute of Metallo-ceramics and Special Alloys of the AS UkrSSR), Kiyev.

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SOV/170-59-3-8/20

AUTHORS: Samsonov, G.V., Koval'chenko, M.S., and Verkhoglyadova, T.S.

TITLE: An Investigation of the Diffusion of Silicon Into Certain Transition Metals (Issledovaniye diffuzii kremniya v nekotoryye perekhodnyye metally)

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1959, Nr 3, pp 62-67 (USSR)

ABSTRACT: The possiblity of forming on the metal surface of solid silicide layers is of considerable interest for modern technique in view of their high durability against acids, molten salts, high heat, and their antithermal emission properties. The authors undertook this investigation for studying silicon diffusion into titanium, tantalum, molybdenum and iron by means of surface saturation. Specimens of these metals and silicon powder served as initial materials for the study. The saturation of specimens with silicon was conducted in a solid-phase pool consisting of 97% Si and 3% NH_4Cl by weight. The saturation with silicon was carried out at temperatures from 600 to 1,200°C in the atmosphere of argon. The relative changes in weight $\frac{\Delta P}{P}$ in dependence on temperature T and saturation time τ can be described by the empirical equation:

$$\frac{\Delta P}{P} = \sqrt{A\tau}\exp\left(-\frac{B}{T}\right) \quad (1)$$

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An Investigation of the Diffusion of Silicon Into Certain Transition Metals

where A and B are constants determined experimentally. After saturation the specimens were subjected to determination of electric resistance and spark-over voltage, to a metallographic investigation, and to measurements of the layer thickness and microhardness of the phases formed. The electric measurements were performed with a device described by G.B. Klark and G.V. Akimov [Ref. 9]. The measurements of layer thickness and microhardness were performed with a PMT-3 device, and the results of them are shown in Table 1. The values of the spark-over voltage are given in Table 2 and the values of activation energy and of certain constants contained in the formulae for diffusion coefficients are given in Table 3. The temperature dependence of silicon diffusion coefficients for all the four metals is shown graphically in Figure 2.

5 SOV/21-59-3-16/27

AUTHORS: Kosolapova, T.Ya., and Samsonov, G.V.

TITLE: The Formation of Chromium Carbides (Polucheniye karbidov khroma)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 3, pp 298-300 (USSR)

ABSTRACT: This article presents a study of the conditions required for the formation of pure single-phase chromium carbides, by means of reaction based on renovation of chronium-oxide

$$3Cr_2O_3 + 13C = 2Cr_3C_2 + 9CO;$$

$$7Cr_2O_3 + 27C = 2Cr_7C_3 + 21CO;$$

$$23Cr_2O_3 + 81C = 2CrC_{23}C_6 + 69CO.$$

Stroitiometric mixtures of soot and chromium-oxide were heated to various temperatures in a furnace with a graphite heater, in a flow of hydrogen. Reaction were evaluated by a chemical analysis of the renovation products and by the relation of pro-

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duct's weight to a theoretical amount of output. In the case of formation of Cr_3C_2 (Figure 1), the complete renovation with appearance of carbide was observed at temperatures of over 1,200°C. At a temperature between 1,400-1,600°C, the content of carbon in carbide was about zero. At over 1,600°C, the content of carbon in carbide dropped because of decomposition connected with the formation of Cr_7C_3. The optimum temperature was found to be between 1,200-1,300°C. The authors established that this process is not good for obtaining $Cr_{23}C_6$, because of the low thermostability of that substance. Results are compiled in a table. There are 2 graphs, 1 table and 5 references, 3 of which are Soviet, 1 English and 1 German.

ASSOCIATION: Institut metalokeramiki i spetsial'nykh splavov AN UkrSSR (Institute of Metaloceramics and Special Alloys of the AS UkrSSR)

PRESENTED: October 12, 1958, by A.K. Babko, Member of the AS UkrSSR

SAMSONOV, G.V., doktor tekhn. nauk; PLOTKIN, S.Ia., kand. tekhn. nauk

Powder metals in the manufacture of chemical equipment. Khim. mash. no.4:37-40 Jl-Ag '59. (MIRA 12:12)
(Powder metallurgy) (Chemical engineering--Equipment and supplies)

18.6200

SOV/180-59-4-23/48

AUTHORS: Koval'chenko, M.S. and Samsonov, G.V. (Kiyev)

TITLE: Several Relationships in Sintering Powders of Refractory Compounds by Hot Pressing

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 4, pp 143-147 (USSR)

ABSTRACT: An investigation was carried out on the hot pressing of carbides of titanium, and tungsten, and borides of titanium, zirconium, and molybdenum using powder of 5 to 8 microns. Fig 1 shows the effect of external pressure on the density of TiC with a loading time of 5 minutes and temperatures 1900 to 2600°C. With lower pressures there is a linear relationship at all temperatures. With higher pressures there is a bend in the curve after which the increase in density proceeds at a slower rate. Fig 2 shows the linear shrinkage against time for hot pressing of TiC at pressures 60 and 115 kg/cm^2 and temperatures 2100 to 2700°C. The highest degree of shrinkage occurs in the first few seconds after applying the load. Fig 3 shows the effect for ZrB_2 of applying 130 kg/cm^2 pressure after some time at 60 kg/cm^2. Fig 4, 5 and 6 show the effects of varying pressing time and pressure on the curves of density

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Several Relationships in Sintering Powders of Refractory Compounds by Hot Pressing

temperature. For TiC the change in density at 1700 to 2300°C takes place at a high rate. For Mo_2B_5 there is a marked increase in density just above 1800°C. Further results of the effect of the pressing time are given in the Tables; Fig 7 shows the influence of pressing time on density and Fig 8 the effect of temperature on residual porosity for titanium boride. The results agree with the theories of Meyerson and Dawihl on shrinkage during hot pressing. In the first stage of densification, the mechanism is deformation of particles with quasi equilibrium between surface tension, strength of particles and external pressure at any temperature. The slower rate of densification takes place by volume diffusion. There are 8 figures, 2 tables and 5 references, 4 of which are Soviet and 1 German.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN USSR (Institute of Cermets and Special Alloys AS UkrSSR)

SUBMITTED: March 2, 1959

SOV/180-59-4-33/48

AUTHORS: Neshpor, V.S. and Samsonov, G.V. (Kiyev)

TITLE: The Plasticity of Titanium Silicides

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 4, pp 202-204 (USSR)

ABSTRACT: The shrinkage of samples made from the silicides $Ti_5Si_3(TiSi_{0.6})$, TiSi and $TiSi_2$ during hot pressing was studied. The silicides were prepared by direct synthesis using a method described previously (Ref 6). The chemical and phase analyses are given in Table 1. The samples were made on a laboratory press without any special protective atmosphere using a pressure of 60 kg/cm^2. The shrinkage was measured by the distance between the top and lower parts (2) of the press in Fig 1. Fig 2 shows the relation between percentage shrinkage and the ratio T/T_s where T is the pressing temperature and T_s the melting point. The curves have two distinct parts (a-b) and (b-c) with a sharp transition at b. This corresponds to the stage when all the particles are in contact and recrystallization begins. The temperature where the point b occurs increases with increase in silicon despite a decrease in the strength of the atomic bond. This is explained by the

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The Plasticity of Titanium Silicides

fact that Ti_5Si_3 has a hexagonal structure. The samples are difficult to remove from the press former. The optimum temperature for obtaining compact but relatively easily extracted samples is 1450°C for Ti_5Si_3 and TiSi and 1350°C for $TiSi_2$. There are 2 figures, 2 tables and 10 references, 7 of which are Soviet and 3 English.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN USSR (Institute of Cermets and Special Alloys, AS UkrSSR)

SUBMITTED: April 20, 1959

SAMSONOV, G.V.

Distr: 4E2c/4E3c 2 cys 4
1-mgc(jd)
1-AS
3

Investigation of CrB_2–Mo. Shou-Hui Tai, G. A. Vasinskaya, and G. V. Samsonov. *Chin Shu Hsüeh Pao* 4, 317–24(1959)(in Russian).—Two eutectics exist in the system. One is at 1980° for 17 mole % CrB_2, and the other is at 2120° for 90 mole % CrB_2. At 1980° the soly. of CrB_2 in Mo does not exceed 3 mole %. At 2120°, the soly. of Mo in CrB_2 is less than 1%. Compd. Cr_2MoB_4 melts at 2260°. Franklin F. Y. Wang

SOV/122-59-5-18/32

AUTHORS: Plotkin, S.Ya., Candidate of Technical Sciences, and Samsonov, G.V., Doctor of Technical Sciences

TITLE: On the Pressing of Metal Powders (O pressovanii metallicheskikh poroshkov)

PERIODICAL: Vestnik mashinostroyeniya, 1959, Nr 5, pp 53-56 (USSR)

ABSTRACT: Investigations are reported on the behaviour of metal powders during pressing. To examine the effect of the duration of pressure application, iron powder, obtained by the reduction of scale, and tungsten powder of 4.2 microns mean particle size were pressed in a cylindrical steel mould at pressures of 2, 4 and 6 tons/cm^2. The duration was varied between instantaneous application and 3 minutes. Briquettes so compressed were sintered in a hydrogen atmosphere at 1000-1150°C for iron and 2100°C for tungsten during 1 hour. The density of iron pressings increased with pressure and duration, e.g. from 4.30 g/cm^3 to 5.65 g/cm^3 between 2 and 6 tons/cm^2 and from 5.65 g/cm^2 to 6.74 g/cm^2 between instantaneous and 3 minute durations, both at 6 tons/cm^2. The density drops after sintering e.g. from 6.74 to 5.83 g/cm^3. The

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On the Pressing of Metal Powders

effects of pressure and duration are similar in principle for tungsten pressings but sintering increases the density, e.g. from 11.52 to 14.20 g/cm^2 when sintered after pressing for 3 minutes at 6 tons/cm^2. The "spring-back" of pressings was examined by measuring the height of a 12.3 mm diameter cylinder before and after the release of pressure. A range of particle sizes and pressures was examined with tungsten, tungsten carbide, iron, copper and aluminium powders. The values of spring-back plotted over the pressure (Fig 1) show a moderate rise but also a drop beyond 6 tons/cm^2 in the case of tungsten carbide. Values range between 1.5 and 2.8%. Tungsten and copper powder pressings were made in a cylindrical mould of 12 mm diameter, followed by pulverising the pressing and repeated pressing. Up to 3 repetitions were carried out. The density goes on increasing from pressing to pressing in copper, provided the subsequent pressure is at least equal to the preceding. The effect

On the Pressing of Metal Powders

is much smaller in tungsten powder pressings. Following H. Unckel (Arch. Eisenhüttenwesen, 18, 161, 1945) the pressure distribution in the mould was examined with a special mould incorporating soft copper rings, into which 4 steel balls are pressed (Fig 2). The sub-division between the pressure on the mould bottom and the friction force on the mould walls can be found. The present tests were mainly concerned with means of reducing the wall friction component. Copper powder obtained by the reduction of copper oxide with hydrogen to a mean particle size of 2-3 microns, iron powder of 2-3 microns and tungsten powder obtained by the reduction of tungsten anhydride were tested with a lubricant consisting of a 4% solution of paraffin wax in petrol (150 cm^3 of lubricant per 100 g of powder). Pressures between 0.4 and 2.5 tons/cm^2 were tried. The friction force component increases with rising pressure without lubricant but decreases with lubricant. Seizure of the mould walls by the powder may be the explanation. The increase of

On the Pressing of Metal Powders

friction force with pressure in iron powder is pronounced. The residual porosity falls with increasing pressure, particularly in copper (by a factor of 2 without lubricant and 3 with lubricant). The strength and hardness in copper and tungsten are lower with lubricant than without, while in iron they are equal either with lubricant or without. There are 2 figures, 5 tables and 3 references, 2 of which are Soviet and 1 German.

Card 4/4

[redacted]

S/123/61/000/012/001/042
A004/A101

AUTHOR: Samsonov, G. V.

TITLE: High-melting materials and their utilization in chemical engineering

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 12, 1961, 11, abstract 12A75 ("Vestn. tekhn. i ekon. inform. N.-i. in-t tekhn.-ekon. issled. Gos. kom-ta Sov. Min. SSSR po khimii", 1959, no. 6 [18], 50-56)

TEXT: The author investigates the chemical resistance of high-melting metal compounds, taking carbides as an example, and analyzes the utilization of high-melting metals and their alloys (Ta, Nb, Ti, V, Zr) in chemical engineering. He presents a table with the physical properties of high-melting metals and their compounds (carbides, nitrides, borides, silicides and sulfides).

[Abstracter's note: Complete translation]

Card 1/1

9.4300

67838
SOV/180-59-6-20/31

AUTHORS: Kislyy, P.S., and Samsonov, G.V. (Kiyev)

TITLE: High-Temperature Semiconductor Thermocouples

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 6, pp 133-137 (USSR)

ABSTRACT: The authors classify service conditions for high-temperature thermocouples and discuss suitable materials with a view to extending the present range of temperature and composition conditions. They give e.m.f. vs temperature curves (Fig 1) for the following alloys (mol %): 20 $MoSi_2$ + 80 B_4C; 20 TiC + 80 $CrSi_2$; 20 TiC + 80 B_4C. The highest e.m.f. is obtained with systems of titanium or zirconium borides with boron carbide, the temperature dependence of which is linear above 300 °C, and these systems are stable. The authors propose a thermocouple design in which molybdenum silicide or titanium or zirconium boride or carbide or similar material forms the sheath. The sheath at the same time is one electrode of the couple, the other being a rod of e.g. boron carbide located inside the sheath. The junction is formed at the tip of the sheath by welding. Fig 3 shows the calibration curves for

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High-Temperature Semiconductor Thermocouples

TiB_2 - B - C; ZrB_2 - B - C; $MoSi_2$ - B - C. Leads are attached either by soldering to a silver-paste deposit or with the aid of copper clips. Laboratory tests of couples for 150 hours at 1600 °C showed their stability to equal that of platinum/platinum-rhodium couples tested at 1200°C but under otherwise similar conditions; production tests were carried out at the Alchevskiy metallurgicheskiy zavod imeni Voroshilova (Alchevsk metallurgical works im. Voroshilov); measuring open-hearth furnace waste-gas temperature showed their suitability for temperatures of 1800-1900°C under oxidizing conditions. The authors maintain that by suitable choice of materials a very wide range of requirements can be covered. For example a series of couples of borided graphite with borides are suitable for vacuum, inert or reducing atmospheres up to 2200-2300 °C, the e.m.f. rising linearly up to 90-120 mV from 5-6 at 300-400 °C.

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There are 3 figures and 16 references, of which 13 are Soviet, 2 German and 1 is English.

67838

SOV/180-59-6-20/31

High-Temperature Semiconductor Thermocouples

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR, Kiyev
(Institute of Metallo-Ceramics and Special Alloys, Academy of Sciences, Ukr. SSR, Kiyev)

SUBMITTED: June 29, 1959

Card 3/3

15(2)
AUTHORS: Samsonov, G. V., Kislyy, P. S.

SOV/131-59-6-9/15

TITLE: Technology of Producing Tubes and Rods of Molybdenum Disilicide (Tekhnologiya izgotovleniya trub i sterzhney iz disilitsida molibdena)

PERIODICAL: Ogneupory, 1959, Nr 6, pp 276-278 (USSR)

ABSTRACT: For the production of tubes and rods of $MoSi_2$ a mold is used in which the mass is pressed through a nozzle, as is shown in figure 1. The unworked tubes and rods were dried for 1 - 2 days at room temperature and then sintered in Tamman furnaces in a hydrogen medium. In doing so, the unworked pieces were at first heated up to a temperature of 600 - 700°, halting time 30 minutes, and then the sintering process was finished at a temperature of 1950°, halting time 5 - 10 minutes. After that the products together with the furnace were cooled down to 900 - 1000°. A deficiency is the high electrical conductivity of the heating elements made of molybdenum disilicide. Experiments introducing silicon- -aluminum- and zirconium oxide in the layer were made to

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increase the electric resistance. Tubules of molybdenum disilicide can be used for the production of electrodes for semi-conductor thermocouples. V. S. Sinel'nikova took part in this work (footnote 1). Figure 3 shows the characteristics of such a thermocouple. There are 3 figures, 1 table, and 4 Soviet references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys of the AS UkrSSR)

CZECH/34-59-6-4/23

AUTHORS: Samsonov, G. V., Nespor, V. S. and Khrenova, L. M.

TITLE: Hardness and Brittleness of Compounds of a Metallic Nature (Tvrdost a křehkost sloučenin kovového charakteru)

PERIODICAL: Hutnické Listy, 1959, Nr 6, pp 484-489 (Czechoslovakia)

ABSTRACT: This is a revised version of a lecture given by Candidate of Technical Sciences G. V. Samsonov in Prague in the Spring of 1958. The high hardness of compounds of a metallic nature like carbides, nitrides, borides and silicides of the transient metals of the fourth to the eighth group of the periodic system is one of the most characteristic properties of these substances. In view of the high brittleness of these compounds, microhardness measurement appears to be the only suitable method of investigating their hardness. Earlier results obtained by the authors of this paper and other authors were published in earlier work (Refs 1 and 2). In this paper the authors describe their studies on the influence of loading of the diamond pyramid during measurement of the microhardness by the Soviet PMT-3 instrument on the measured microhardness values; the brittleness of the substances was evaluated

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Hardness and Brittleness of Compounds of a Metallic Nature

from the character of the indentation on the surface of test specimens during the indentation with the pyramid. The measured values of the microhardness, H_M kg/mm^2, obtained with loads of 20 to 200 g and of the microbrittleness Z for 31 carbides, nitrides and silicides are entered in Table 1, p 485. The microhardness studies of very hard substances, described in the paper, prove that a clearly defined relation exists between the microhardness and the magnitude of the applied load and this can be clearly seen from the data entered in Table 1 and from the graphs, Figs 1-4. The brittleness of the compounds was measured by a microhardness method described by N. I. Ikornikova (Ref 15). The method consists of making imprints with a diamond pyramid with various loads and evaluating the number and the character of the produced cracks and other defects. The thus determined results are entered in Table 2, p 488. It was found that the dependence of the microhardness on the load is the same for materials with very high and with relatively low hardness values and appears to be

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Hardness and Brittleness of Compounds of a Metallic Nature

governed by the character of the plastic deformation of the surface of the hard materials during the micro-hardness measurements. The brittleness characteristics determined in the work described in this paper are in agreement with brittleness values determined for some compounds by other authors. The brittleness increases with decreasing square value of the deflection of the centre of the molecular complexes during thermal oscillations in the crystal lattices of the compounds, i.e. it increases if the strength of the interatomic bonds increases and if the stress relaxation in the material decreases. The hardness of compounds of a metallic nature increases in the following order: silicides, nitrides, carbides, borides, whilst the brittleness increases in the following order: silicides, borides, nitrides, carbides.
There are 10 figures, 2 tables and 19 references, 1 of which is Czech, 16 Soviet, 2 English.

Card 3/3

S/137/62/000/006/077/163
A052/A101

AUTHORS: Koval'chenko, M. S., Samsonov, G. V.

TITLE: Investigation of zirconium boride-molybdenum alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 35, abstract 60266 (In collection: "Vopr. poroshk. metallurgii i prochnosti materialov". Kiyev, AN UkrSSR, no. 7, 1959, 18 - 24)

TEXT: The reaction of ZrB_2 with Mo was investigated by methods of metallographic, X-ray, visual, thermal and dilatometric analyses. A hypothetical constitution diagram of ZrB_2-Mo is plotted. There are 12 references.

O. Padalko

[Abstracter's note: Complete translation]

Card 1/1

30583

S/081/62/000/010/060/085
B168/B180

15.2240

AUTHOR: Samsonov, G. V.

TITLE: Nature of the interaction of the borides of titanium, zirconium and tungsten with their carbides

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 10, 1962, 411, abstract 10K173 (Sb. "Vopr. poroshk. metallurgii i prochnosti materialov", no. 7. Kiyev, AN USSR, 1959, 72 - 98)

TEXT: Some of the properties of fusions of the systems TiB-TiC, TiB_2-TiC, ZrB-ZrC, ZrB_2-ZrC and W_2B_5-WC were investigated. On the basis of X-ray metallographic investigations and measurements of microhardness it was established that the systems TiB-TiC and ZrB-ZrC are continuous series of solid solutions; in the system TiB_2-TiC solubility of TiB_2 in TiC (up to 20 mol.%) and very low solubility of TiC in TiB_2 were found; in the systems ZrB_2-ZrC and W_2B_5-WC there was almost no miscibility of the components. The triple compounds Ti_2B_2C and W_2B_2C do not form in the systems. For

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S/081/62/000/010/060/085
B168/B180

Nature of the interaction of...

TiB and ZrB microhardness values of 2700 - 2800 and 3500 - 3600 kg/mm^2 respectively were determined with a 30 g load. It was established that resistance to oxidation in air of the fusions of the systems TiB_2-TiC, ZrB_2-ZrC and W_2B_5-WC varies practically additively, the curves being flat and without extremes. [Abstracter's note: Complete translation.]

Card 2/2

S/137/62/000/006/072/163
A052/A101

AUTHORS: Samsonov, G. V., Neshpor, V. S.

TITLE: Thermoemissive properties of transition metals and their compounds with boron, carbon, nitrogen and silicon

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 32, abstract 6G247 (In collection: "Vopr. poroshk. metallurgii i prochn. materialov". Kiyev, AN UkrSSR, no. 7, 1959, 99 - 104)

TEXT: Published data relating to the electric resistance and the work function of transition metals and their compounds with B, C, Na_2 and Si are analyzed. Electric resistance of metals increases with the growth of the value $\xi = (1/Z_d\ n)$, where Z_d is the number of electrons in a vacant shell and n is the main quantum number. This is connected with an increased shielding effect of defective shells. For metals the work function decreases with an increase of ξ. For refractory compounds of carbide, boride and nitride type these dependences have a reversed character, which is connected with the filling up of the holes in defective orbits by metalloid electrons and the corresponding decrease of the shielding effect.
[Abstracter's note: Complete translation]

R. Andriyevskiy

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Samsonov, G. V.

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SOV/21-59-8-12/26

AUTHOR: Samsonov, G.V., Synel'nykova, V.S., Kulyy, P. O. (Samsonov, G. V., Sinel'nikova, V. S., Kulyi, P. S.)

TITLE: Alloys of the Boron Carbide - Molybdenum Disilicide System

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 8, pp 866 - 868 (USSR)

ABSTRACT: The alloys of boron carbide with molybdenum disilicide posses a high and stable thermal e. m. f. which is used when creating high-temperature thermocouples [Ref. 1]. The boron carbide, however, is, at its high resistance to heat, [Ref. 2] not yet sufficiently resistant to oxidation at high temperatures. This calls forth the necessity to add components to the alloy which avert or stop its oxidation. In connection with this, the properties of boron carbide - molybdenum disilicide alloys were subjected to investigations based upon the method of metallography, X-ray patterns, conductivity and thermal e. m. f. Formation of the quadripartite phase Mo (B_1C_1, Si) is found. It has a very wide homogeneous region across which (from 10 to 50 mol.% $MoSi_2$ in alloys with boron carbide) electrical resistance

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Alloys of the Boron Carbide - Molybdenum Disilicide System

increases and thermal e. m. f. decreases, in accordance with the degree of defectiveness of the lattice of this phase. The investigation of alloys in view of their resistance to oxidation has shown (Photo 2), that an alloy which according to its composition corresponds approximately to the quadripartite chemical compound, possesses the highest resistance to oxidation. Additions of disilicide of less than 50 mol.% decrease the resistance of alloys to oxidation. There is one set of photos, 1 diagram and 5 references, 3 of which are Soviet, 1 American and 1 German.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys of the AS of UkrSSR)

By V. M. Svechnikov, Member of AS UkrSSR

PERIODICAL:

SUBMITTED: December 22, 1958

SOV/21-59-9-12/25

AUTHOR: Slyeptsov, V.M. and Samsonov, G.V.

TITLE: On the Problem of the Solubility of Boron in Silicon

PERIODICAL: Dopovidi Akademiyi nauk Ukrayins'koyi RSR, Nr 9, 1959, pp 982-984 (USSR)

ABSTRACT: In view of the fact that the fusions of boron and silicon have not yet been sufficiently studied, although they are of great interest due to their high degree of hardness, chemical resistance [Ref 1, 2] and particularly due to their semiconductor properties established by several scientific investigators [Ref 3 - 6], the authors conducted investigations of some boron and silicon fusions in order to establish their properties and the solubility of boron in silicon. The solubility of boron and silicon was investigated by the metallographic and X-ray methods. The results (Graph Nr 1) show that this solubility at room temperature constitutes nearly 0.50 wt per cent (1.2 at p.c.) and increases to 1.6 wt per cent (2.9 at p.c.)

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